

THE ROUGH FESCUE DOMINATED COMMUNITY
TYPES IN THE FOOTHILLS OF
NORTH-CENTRAL
ALBERTA



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THE ROUGH FESCUE DOMINATED COMMUNITY TYPES IN THE FOOTHILLS OF NORTH-CENTRAL ALBERTA

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METHODS

All of the data from the rough fescue dominated communities identified by Willoughby (2001), Willoughby (1997) and Willoughby et al. (2001) in the Upper Foothills, Subalpine and Montane subregions of Alberta were classified using both cluster analysis (EAS) and ordination (PC-ORD). The data included plots from near the Ya-Ha-Tee, Harrison, Bow, Forty Mile, Flat, Upper Clearwater Forest Land (the Zone), Ribbon Falls, Panther Creek and Wilson

Lawson (1969) and Hill (1993) tell that the third rough fescue zone was dominated by Northern rough fescue, but there appears to be extensive overlap between this species and northern rough fescue, particularly in the southern part of the zone west of Rocky Mts. House and Sundre.

ABSTRACT

The fescue grasslands of Alberta are an important grazing resource for both wildlife and domestic livestock. These grasslands are also found in some of the most ecological diverse areas of the province. Looman (1982) described three zones of rough fescue in Alberta, characterized by a different species. In the Northern rough fescue zone, north of 51° N latitude in the foothills of North-central Alberta three undisturbed rough fescue dominated types have been described. These include the Rough fescue-Hairy wildrye dominated community which is found on dry, well-drained sites. On moister sites with deep snow accumulation bog birch will invade to form the Bog birch/Rough fescue/Bearberry dominated community type. In contrast, on moist, rich sites tufted hairgrass co-dominates with rough fescue to form the Rough fescue-Tufted hairgrass dominated community type. This paper will describe and examine the successional relationships of these community types in the presence and absence of disturbance.

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INTRODUCTION

Looman (1982) and Hill (1995) recognized three zones of rough fescue in Alberta (Figure 1) each characterized by a different species (Pavlick and Looman 1984). The largest zone (I) included the Foothills and Central Parkland (Strong and Thompson 1995) of east-central Alberta and is dominated by Plains Rough fescue (*Festuca hallii*). The second zone (II) is dominated by Foothills Rough fescue (*F. campestris*) and includes the Foothills fescue, Montane and Subalpine subregions of southwestern Alberta and the Cypress Hills. The third zone (III) is dominated by Northern rough fescue (*F. altaica*) and extends north of 50° N latitude along the foothills and mountains of north-central Alberta and includes the Upper Foothills, Subalpine and Montane subregions.

Classification of the Rough fescue dominated communities have been made by Willoughby et al. (2001) for the Foothills rough fescue zone, but only a limited classification is available for the Northern rough fescue¹ zone. Particularly, it is not clear how the rough fescue grasslands are related between the Upper Foothills, Montane and Subalpine subregions.

The rough fescue grasslands of North-Central Alberta are important locally for grazing by livestock and wildlife. Morgantini and Russell (1983) found that rough fescue made up over 69% of the elk winter diet in the Ya Ha Tinda area. These grasslands are also important in maintaining the local biodiversity. Despite the importance of these grasslands there is little understanding of their ecology. Willoughby (2001) and Willoughby (1999) have identified a Rough fescue-Hairy wildrye, Rough fescue-Tufted Hairgrass and Bog birch/Rough fescue/Bearberry dominated communities in the Upper Foothills and Subalpine subregions within this zone, but no attempt has been made at examining the relationship between these community types across the various subregions. In this paper the data from the rough fescue dominated communities north of 51° N latitude located within the Upper Foothills, Subalpine and Montane subregions were combined in order to determine the similarity and successional relationships of these types.

METHODS

All of the data from the Rough fescue dominated communities identified by Willoughby (2001), Willoughby (1999) and Willoughby et al. (2001) in the Upper Foothills, Subalpine and Montane subregions of Alberta were classified using both cluster analysis (SAS) and ordination (PC-ORD). The data included plots done near the Ya Ha Tinda ranch, Harrison flats, Forty Mile Flats (Upper Clearwater Forest Land Use Zone), Ribbon Flats, Panther Corners and Wilson

¹Looman (1969) and Hill (1995) felt that the third rough fescue zone was dominated by Northern rough fescue, but there appears to be extensive overlap between this species and Foothills rough fescue, particularly in the southern part of the zone west of Rocky Mtn. House and Sundre.

Creek range allotment. These data also included rangeland reference area data from, McCue Creek, Yara Creek, Harold Creek, Upper James River, Seven mile burn, Elk Creek and Eagles Nest Cabin (Willmore Wilderness Park) (Weerstra and Willoughby 1998). The reference area data included grazed and ungrazed transects with over 30 years of data from a number of the sites. The initial classification was complicated by the fact that a number of the transects represented grazing and fire disclimax community types. In order to gain a better understanding of the ecology of these sites in the absence of disturbance only the undisturbed transects were reordinated and classified. This left 64 transects which included the inside ungrazed transects from 1981 to 2000 at the Upper James (UJR) and McCue Creek (MC) reference areas, from 1991 to 2000 at the Harold Creek (HC) reference area, from 1998 to 2000 at Eagles Nest cabin (EN) and Wilson Creek allotment (WCT01). The inside and outside transects from 1979 to 1985 at Yara Creek (YC), from 1991 to 2000 at Elk Creek (EC) and the unburned transects at Seven Mile Burn (SMB). Data from Ribbon Creek Flats (RF) prior to brush clearing (MacCallum and Yakimchuk 1992), Panther Corners (PANT)(AGRA 1998) and Forty Mile Flats (FM) were also included in the analysis.

Both the Ya Ha Tinda (YE,YW) and Harrison flats (H) areas of the province have extensive areas of rough fescue grassland that support large herds of elk. In an effort to determine how these disturbed grasslands were ecologically related to the other undisturbed rough fescue dominated community types the Ya Ha Tinda and Harrison transects were reordinated with the summarized species lists of the undisturbed Rough fescue-Hairy wildrye (HWR), Bog birch/Rough fescue/Bearberry (BEG) and Rough fescue-Tufted hairgrass (TUFT) community types.



Figure 1. Rough fescue dominated zones in Alberta. Adapted from Looman (1982)

Ordination (DECORANA)(Gauch 1982) and cluster analysis (SAS) multivariant techniques combine the sites based on the similarity of species composition. The groupings from cluster analysis were overlain on the site ordination. Soil moisture, nutrients, drainage, elevation and slope data were collected in the procedure outlined in the Ecological Land Survey Site Description Manual (1994). These data were correlated with the ordination axes using PC-ORD in an effort to determine which environmental variables accounted for the most variation in the species-stand table. These data were presented in a species-environment biplot.

Rangeland reference area sites were selected from within range allotments on areas that represented primary range. Originally sites thought to be in poor range condition were selected. These sites were usually represented by open grasslands on south-facing slopes, benchlands and terraces. The reference sites were not located near salt or within 100-ft. (30-m) of a fence. The preferred distance from a water source was greater than 1000-ft. (300-m) but less than 1-mi. (1.6-km). Each reference site consisted of a fenced exclosure and a 100-ft (33-m) transect inside and outside the exclosure. The outside transect was situated 25-ft (8-m) or greater from the edge of the exclosure. At 3-in. (7-cm) intervals, the basal frequency of the plant species were recorded using Parker's loop (Parker 1954). In 1981, the canopy cover of the plant species was also recorded (at 6-ft. (1.8-m) intervals) using a 20x50 cm Daubenmire frame. Presently, the transects are being recorded every three years. All the basal frequency data prior to 1981 was converted to canopy cover using regression analysis.

Transect data from non-rangeland reference area sites were collected in order to develop management plans for the various range allotments. These data were collected using the methodology outlined by Dale et al. (2001).

RESULTS

Species composition

The ordination and cluster analysis of the undisturbed rough fescue dominated communities in zone 3 is outlined in Figures 2 and 3. The first two axes in the ordination accounted for 49% and 16% of the variation in the species stand table, respectively (Figure 2). There is a distinct grouping of the transects done at Yara Creek (YC), McCue Creek (MC), Upper James River (UJR), majority of the Panther Corner transects and Forty Mile flats. These transects are dominated by rough fescue, hairy wildrye and slender wheatgrass and represent the Rough fescue-Hairy wildrye community type. The transects located at Harold Creek (HC), Eagles Nest (EN) and Wilson Creek (WCT) were all dominated by rough fescue and tufted hairgrass and they grouped together to form the the Rough fescue-Tufted hairgrass dominated community type.

The final grouping was all of the transects that were dominated by bog birch, rough fescue and bearberry. These included the Seven Mile Burn, Ribbon Flats, Elk Creek and a number of transects located within Panther Corners. Both the cluster analysis (Figure 3) and ordination (Figure 2) indicated that the Rough fescue-Tufted hairgrass and Rough fescue-Hairy wildrye dominated community types were much more similar than the transects dominated by rough fescue, bearberry and bog birch. Indeed, cluster analysis indicated that the Rough fescue-Tufted hairgrass transects grouped together within the larger Rough fescue/Hairy wildrye dominated group (Figure 3).



The species-environment biplot is outlined in Figure 4. Species characteristics of the Bog birch/Rough fescue/Bearberry community, bog birch (*betugla*), bearberry (*arctuva*), oatgrass (*dantcal*, *dantpar*), willow (*salimyr*, *salispp*, *salibeb*), scapose hawk's beard (*creprun*), blueberry (*vacccae*), alpine bistort (*polyviv*), valeriana (*valesit*), graceful sedge (*carepre*) were found on the right side of axis one and were situated around the ordinates of higher moisture and higher (poorer) drainage.

In contrast species characteristic of the Rough fescue-Hairy wildrye community, shrubby cinquefoil (*potefru*), rose (*rosaaci*), fringed and prairie sage (*artefri*, *artelud*), white scaled sedge (*carexer*), browned eyed susan (*gailari*), locoweed (*oxytmon*, *oxytser*), junegrass (*koelmac*), cut leaved anemone (*anemmul*) and bog sedge (*kobrmmyo*) were found on the left side of axis 1 and

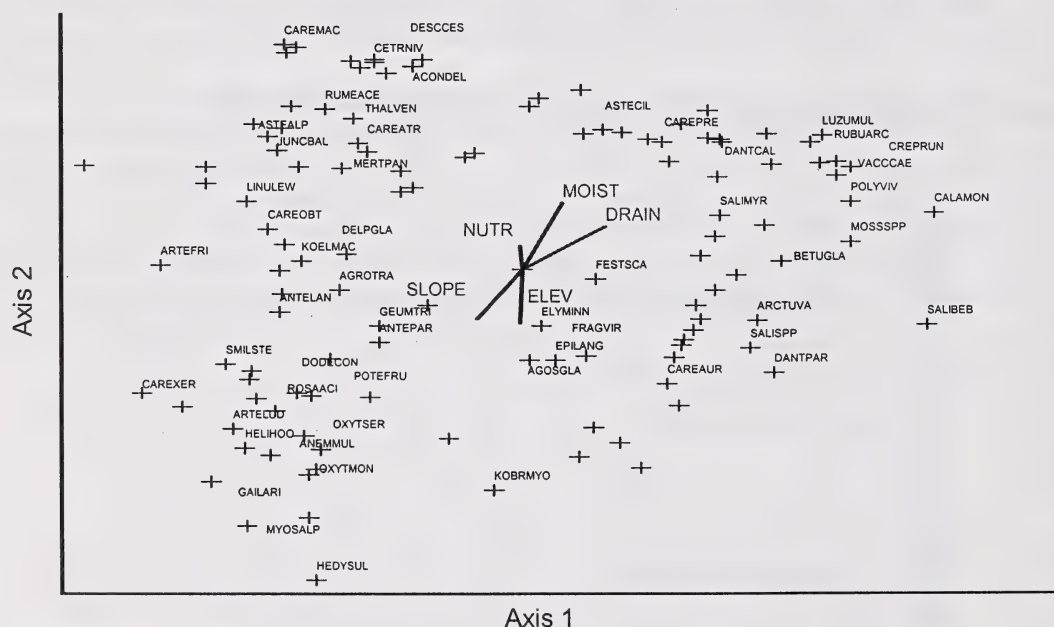


Figure 4. Biplot ordination of selected plant species and environmental variables for all undisturbed rough fescue dominated transects in zone III.

bottom of axis 2 and tended to have lower moisture, nutrients and were more rapidly drained. Many of these plots were also found at higher elevations and were located on steep south facing slopes. Species characteristic of the Rough fescue-Tufted hairgrass community, tufted hairgrass

(descces), monkshood (acondel), veiny meadow rue (thalven), thick-spiked and long-bracted sedges (caremac, careatr), tall lungwort (mertpan), dock (rumeace), arctic rush (juncbal) were found at the top of axis 2. These species were correlated with higher moisture and were found on somewhat richer sites. Species that were common to all three types tended to be found in the middle of the ordination rough fescue (festsca), hairy wildrye (elyminn), slender wheatgrass (agrotra), old man's whiskers (geumtri), strawberry (fragvir), mountain dandelion (agosgla), blunt sedge (careobt), flax (linulew), shooting star (dodecon) and fireweed (epilang).

Table 1 outlines the differences in species composition between the various community types. All three community types were dominated by rough fescue which was not significantly different between the types. The Rough fescue-Hairy wildrye community type had a significantly higher cover of shrubby cinquefoil and slender wheatgrass than the Rough fescue-Tufted hairgrass or Rough fescue/Bearberry/Bog birch community types. In contrast, the Rough fescue-Tufted hairgrass had a significantly higher cover of tufted hairgrass than the other community types and the Rough fescue/Bearberry/Bog birch community had the highest cover of bog birch, bearberry and oatgrass species (Parry and California) (Table 1).

Table 2 outlines the physical characteristics of each plant community type. The soils of each community type are very similar ranging from Orthic Eutric and Melanic Brunisols on the Rough fescue-Hairy wildrye and Bog birch/Rough fescue/Bearberry communities to Cumulic and Orthic Regosols on the Rough fescue-Tufted hairgrass community. All of the communities have fluvial and lacustrine parent materials and their textures range from loamy at the surface to Clay loams and Silty Clay Loams at depth. The pH ranges from 5-8 and the depth of the Ah horizon averages from 3-10 cm for all community types. The Rough fescue-Tufted hairgrass or Bog birch/Rough fescue/Bearberry community is slightly moister ranging from mesic to subhygric, than the Rough fescue-Hairy wildrye community type which has a submesic to mesic moisture regime. The Rough fescue-Tufted hairgrass community also has slightly poorer drainage and higher nutrients than the other community types with gleying at depth at one site.

Table 1. Canopy cover of selected species in each of the three rough fescue dominated community types in Zone III.

Species	Rough fescue- Hairy wildrye	Rough fescue- Tufted hairgrass	Rough fescue Bearberry/ Bog birch
Shrubs			
SHRUBBY CINQUEFOIL (<i>Potentilla fruticosa</i>)	4a*	1b	1b
BOG BIRCH (<i>Betula glandulosa</i>)	0b	Tb	32a
Forbs			
OLD MAN'S WHISKERS (<i>Geum triflorum</i>)	9a	2c	6b
COMMON YARROW (<i>Achillea millefolium</i>)	3a	3a	3a
GRACEFUL CINQUEFOIL (<i>Potentilla gracilis</i>)	4a	2a	Ta
AMERICAN VETCH (<i>Vicia americana</i>)	3a	Ta	1a
MOUNTAIN DANDELION (<i>Agoseris glauca</i>)	1a	Ta	1a
VEINY MEADOW RUE (<i>Thalictrum venulosum</i>)	1b	4a	1b
TALL LARKSPUR (<i>Delphinium glaucum</i>)	2a	Tb	1b
BEARBERRY (<i>Arctostaphylos uva-ursi</i>)	1b	Tb	10a
Grasses			
NORTHERN AND FOOTHILLS ROUGH FESCUE (<i>Festuca altaica</i> , <i>F. campestris</i>)	21a	17a	28a
HAIRY WILDRYE (<i>Elymus innovatus</i>)	5a	5a	4a
SLENDER WHEATGRASS (<i>Agropyron trachycaulum</i>)	7a	3b	3b
SEDGE SPECIES (<i>Carex obtusata</i> , <i>C. siccata</i> <i>C. praeegracilis</i> , <i>C. atosquama</i>)	9a	9a	9a
TUFTED HAIRGRASS (<i>Deschampsia cespitosa</i>)	Tb	12a	Tb
JUNEGRASS (<i>Koeleria macrantha</i>)	1a	Tb	1b
CALIFORNIA OATGRASS (<i>Danthonia californica</i>)	Tb	0b	3a
PARRY OATGRASS (<i>Danthonia parryi</i>)	Tb	0b	2a
BOG SEDGE (<i>Kobresia myosuroides</i>)	1a	0a	Ta

*Means with the same letter within a row are not significantly different according to an LSMEANS test at the 0.05 level .

Table 2. Site characteristics of the three undisturbed rough fescue dominated community types in Zone III.

Site characteristics	Rough fescue -Hairy wildrye	Rough fescue -Tufted hairgrass	Rough fescue/ Bearberry/ Bog birch
Soil (subgroup)	O. Melanic Brunisol ¹ O.Eutric Brunisol ⁷ O. Humic Regosol ²	Cumulic Regosol ⁵ Orthic Regosol ⁵	O.Eutric Brunisol ¹⁰
Parent material	Fluvial, Colluvial apron, Glacial fluvial	Fluvial, Glacial Fluvial	Lacustrine, over glacial till
Surface Texture	L	L	L
Effective texture	CL, SiL, SiCL, SiC	CL, SiCL	CL, SiL, SiC
pH	5-8	5-6.5	5-8
Ah thickness (average)	2-27(10)	2-4(3)	2-5(4)
Humus form	Mor, Mull	Mor	Mull, Mor
Depth to Gleying	None	None, 60cm	None
Moisture	Submesic, Mesic	Mesic, Subhygric	Mesic, Subhygric
Nutrient	Mesotrophic, Permesotrophic	Mesotrophic, Permesotrophic	Mesotrophic
Drainage	Well	Moderately well, Well	Well
Elevation (m)	1470-2150	1370-1737	1300-1981
Aspect	Level, South	North, East, South	Level, South
Slope (%)	0-22(9)	2-3(2)	1-2(1)
Number of Soil Pits	10	2	4

1 Indicates percentage of soil pits with this soil subgroup (ie 1=10%)

Ya Ha Tinda, Harrison Flats

The ordination of the Ya Ha Tinda (YE, YW) and Harrison flats (H) transects with the summarized undisturbed rough fescue community types is outlined in Figure 5.

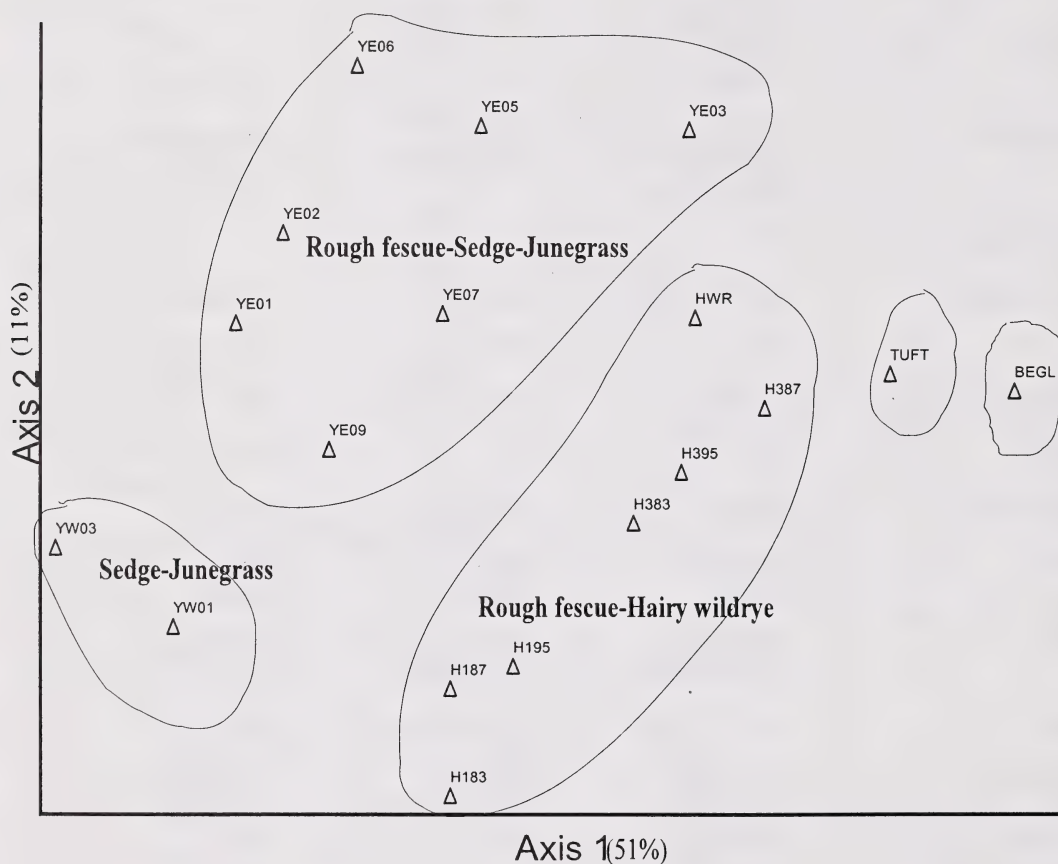


Figure 5. Ordination of Ya Ha Tinda and Harrison flats transects with the summarized undisturbed rough fescue dominated community types in Zone III

The first two axes accounted for 51% and 11% of the variation in the species-stand table respectively. The ordination indicates that the Ya Ha Tinda and Harrison flat grasslands have a closer affinity with the Rough fescue-Hairy wildrye (HWR) community than either the Rough fescue-Tufted hairgrass (TUFT) or Bog birch/Rough fescue/Bearberry (BEGL) dominated

community types.

There is a distinct grouping of the Ya Ha Tinda plots into two community types. The first type was described on grasslands east of Scalp Creek (YE). These transects were dominated by shrubby cinquefoil, rough fescue or sedge, junegrass, fringed brome, old man's whiskers and early yellow locoweed and represent the Rough fescue-Sedge-Junegrass community type (Willoughby et al. 2001). This community type was the most extensive grassland community described in the Ya Ha Tinda area. The other community type was described west of Scalp Creek near the Ya Ha Tinda ranch buildings. The transects (YW) in this community were dominated by shrubby cinquefoil, sedge, junegrass, Kentucky bluegrass, showy locoweed and cut leaved anemone. These transects represented a Sedge-Junegrass community type.

In contrast the Harrison flats transects were the most similar to the summarized Rough fescue-Hairy wildrye (HWR) community and were dominated by shrubby cinquefoil, rough fescue, sedge, junegrass, old man's whiskers and early yellow locoweed. The dominant species on the Harrison transects are very similar to the dominant species at the Ya Ha Tinda, but the cover of rough fescue averaged 35% at Harrison flats in comparison to only 10% at the Ya Ha Tinda (Appendix 1).

DISCUSSION

The rough fescue dominated grasslands follow the creeks and river valleys throughout the foothills of the Rocky Mountains north of Calgary to Willmore Wilderness park near Grande Cache. The topography of the area consists of both mountains and foothills. Closed-canopy coniferous forest dominates the area with potential climax species on modal sites being white and black spruce with lodgepole pine as an early successional species (Strong 1992). The valley bottoms have predominant willow and bog birch cover with pockets of open grassland. The south facing slopes are also covered by grassland.

The rough fescue dominated grasslands are generally found on mesic to subhygric, well drained sites within these valley bottoms and on lower slope positions of south facing slopes. On moister and richer sites tufted hairgrass and graceful sedge often replaces rough fescue as the dominate species in the community. On steep dry south facing slopes hairy wildrye, junegrass, sedge species and fringed sage tend to dominate (Willoughby 2001).

Soil moisture and nutrients appear to account for most of the variation within the ordination of the undisturbed rough fescue dominated community types. Moisture is a major limiting factor limiting the distribution of plants (Krebs 1978). In this study it appears there was a definite species response to a moisture and nutrient regime gradient. Species characteristic of moist, medium rich sites included bog birch, willow, graceful sedge, and alpine bistort. These species were indicative of the Bog birch/Rough fescue/Bearberry community type. Species characteristic of moist, rich sites included tufted hairgrass, long-bracted sedge, monkshood, tall lungwort and dock. These species were characteristic of the Rough fescue-Tufted hairgrass community type. In contrast species characteristic of dry, well drained, medium to rich sites included bog sedge, fringed sage, shrubby cinquefoil and locoweeds. These species were characteristic of the Rough fescue-Hairy wildrye community type.

Plant community ecology

Bog birch/Rough fescue/Bearberry

de Groot (1998) found that bog birch tended to prefer moist, acidic, nutrient poor organic soils which were well drained. Anderson (1975) also found that bog birch is very sensitive to extremely cold winter temperatures, but can survive temperatures to as low as -27°C if sufficient snowfall occurs. The presence of bog birch on these rough fescue dominated grasslands may indicate sites which have deeper snow accumulations, which insulate bog birch from the extreme winter conditions. The deeper snow accumulations would also increase soil moisture in the spring further favouring bog birch growth. The surface of this community is well drained and dries out quickly in the summer favouring the growth of rough fescue, junegrass, bearberry, Parry oatgrass and California oatgrass plant species.

Repeated fire (every few years) reduces bog birch canopy cover and above ground biomass, but has only a minimal effect on bog birch mortality (de Groot 1998, Bork et al. 1996). Bork et al. also found that burning bog birch three times in 9 years controlled shrub growth and increased forage production by over 40% compared to the unburned control. The increase in bog birch cover in the absence of fire is evident from the pictures taken at the Elk Creek rangeland reference area from 1968 to 2000 (Photo 1).

Rough fescue-Hairy wildrye

The Rough fescue-Hairy wildrye dominated community is found on submesic to mesic, well drained sites. This community can also be found on south facing slopes in lower slope positions where some moisture accumulates (Willoughby 2000). In the absence of grazing and fire it appears this community type will eventually succeed to conifer forest (Willoughby 2000), but the time frame for complete tree invasion appears to be greater than 60 years. Willoughby also found that increased grazing pressure by domestic livestock leads to a decline in rough fescue and other native species and allows species like Kentucky bluegrass and dandelion to dominate the site to form a Kentucky bluegrass-Sedge dominated community type.

Initial analysis of the Ya Ha Tinda ranch and Harrison flats rough fescue dominated grasslands indicated that these grasslands were very different from the other undisturbed rough fescue dominated types. Work by Looman (1969), found that these grasslands supported a large elk herd during the winter when they remained snow free. It would appear that this heavy dormant season grazing has altered the community structure so that these grasslands do not resemble the other undisturbed or grazed Rough fescue-Hairy wildrye community types. Bailey et al. (1988) found that heavy dormant season grazing lowered plains rough fescue cover and allowed species like junegrass, sedge, slender wheatgrass, fringed sage and pussytoes to increase in the Aspen parkland. They also found that forage production was significantly lower under



1968



2000

Photo 1: The lack of fire has allowed bog birch cover to increase on both the grazed and ungrazed transects at the Elk Creek rangeland reference area from 1968 to 2000.

heavy dormant season grazing compared to the ungrazed control. They concluded that heavy dormant season grazing was having the same impact on the community as a light June grazing treatment. It would appear that the heavy grazing by wildlife during the winter is having a similar affect on the majority of the Ya Ha Tinda grasslands.

The other Ya Ha Tinda grassland community type (Sedge-Junegrass) that was described by Willoughby et al. (2001) was found in an area where the Ya Ha Tinda ranch feeds hay to horses during the winter. The horses also graze this area early in the spring. This grazing pressure has allowed Kentucky bluegrass to invade onto this community type and it would appear that this community type is succeeding to a community that is similar to a number of the grazed transects of the rangeland reference areas to the east of the ranch in the Red Deer river valley (Willoughby 2000).

It would appear that the grasslands of the Ya Ha Tinda represent grazing disclimax community types. If protected from grazing these grasslands would likely succeed to a community type that is similar to the undisturbed Rough fescue-Hairy wildrye dominated type.

Rough fescue-Tufted hairgrass

The Rough fescue-Tufted hairgrass community is found on moderately well drained, subhygric, rich sites. This community type appears to represent the transition between the drier Rough fescue-Hairy wildrye community and the moister and richer Tufted hairgrass-Sedge dominated community type (Willoughby 2001). Willoughby (1998) found a 25% increase in shrub cover in only 25 years on the Tufted hairgrass-Sedge community type, but this community type is rarely shrub covered. Photos taken at the Harold Creek rangeland reference area in 1963 and again in 2000 show little shrub expansion in over 30 years of no disturbance (Photo 2). Lane et al. (2001), have found that there has only been an 18% increase in shrub cover on this community type in Willmore Wilderness Park in over 40 years. Presently it is not clear why shrub expansion is slower in this community type.

Continued grazing pressure causes rough fescue to decline and initially tufted hairgrass and sedge increase in cover. However, continued grazing pressure causes a further decline in all native species and the site will become dominated by Kentucky bluegrass, dandelion and clover species (Willoughby 2001). In Willmore where there is little seed source for Kentucky bluegrass and these heavily grazed Rough fescue-Tufted hairgrass types are often dominated by alpine timothy, slender wheatgrass, sedge and tufted hairgrass. Many of the sites have also been invaded by tall buttercup.

SUMMARY

The fescue grasslands of Alberta represent some of the most ecologically diverse areas of the province. Historically, the desired plant community of these grasslands was one that maximized beef production, which has led to a decline in condition of many of these grassland communities. In recent years there has been a movement towards more sustainable use of our natural resources. The scope of sustainability has shifted from being defined by economic assesment to include broader sustainability of ecological functions and patterns (Lee and



1963



1994

Photo 2: In over 30 years of protection from grazing and fire there has been little shrub expansion at the Harold Creek rangeland reference area. However, shrub expansion has continued on the moister sites in the background

Hanus 1998). Today society desires the conservation of native plant communities. In North-central Alberta these rough fescue dominated grasslands are important locally for both wildlife and domestic livestock. They also contribute to the local biodiversity of the area. Despite their importance there is only limited understanding of their ecology. This paper describes and presents a classification of the rough fescue dominated community types of the foothills of North-central Alberta. This classification recognizes three rough fescue dominated community types and outlines the successional relationships of each type. Hopefully, this classification can be used to ensure the conservation of these native grasslands.

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APPENDIX ONE:

**VEGETATION SPECIES LISTS FOR THE VARIOUS PLANT COMMUNITY TYPES:
INCLUDES YA HA TINDA AND HARRISON FLATS**

Group name: Rough fescue-Hairy wildrye

		Avg		Avg		Plots																										
LAYER	n	SPECIES	% P	MC	Avg	MC81I		MC85I		MC88I		MC91I		MC94I		MC97I		MC99I		MC00I		YC79I		YC790		YC81I		YC810		YC85I		
						Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv
5	1	POTEFRU	77.1	03.8	01							01			02		01		03		01		03		03		05		05		01	
	2	ARCTUVA	11.4	00.6																			02									
	3	ROSAACI	08.6	00.1																												
	4	POPUTRE	05.7	00.0																												
	5	POTEGRA	05.7	00.0																												
6	6	POTEGRA	97.1	03.5	05	02				05	02	00	01	02	01				08		04		03		03		04		08		01	
	7	ACHIMIL	94.3	03.3	07	02				02	05	02	02	01	00		01		04		09		03		03		05		01		01	
	8	GALIBOR	91.4	02.4	04	01				01	02	01	00	00	00		00		01		04		03		03		04		01		01	
	9	GEUMTRI	88.6	09.0	30	12				34	07	08	14	10	22		14		22		12		06		09		12		04		04	
	10	VICIAME	88.6	02.5	00	00				00	00	00	00	00	00		00		00		09		02		03		09		16		01	
	11	AGOSGLA	82.9	01.2	00	00				00	00	00	00	01	02		00		02		00		02		03		00		03		00	
	12	CERAARV	80.0	00.5	00	00				00	00	00	00	01	00		00		01		00						00		00		00	
	13	CAMPROT	77.1	00.7	00	00				00	08	01	02	05	10		04		10		02						00		02		02	
	14	DELPGLA	74.3	02.1	02	01				01	01	01	00	01	02		01		02		02		02		02		00		04		00	
	15	TARAOFF	65.7	01.3	01	01				01	01	01	00	01	01		00		02		02		02		02		00		01		00	
	16	THALVEN	62.9	01.4	06	01				02	01	02	01	00	00		00		00		02		02		02		01		18		01	
	17	FRAGVIR	57.1	01.8	00	00				00	00	00	00	00	00		00		00		03		03		04		01		02		01	
	18	DODECON	48.6	00.4	00	00				00	00	00	00	00	00		00		00		16					01		02		08		02
	19	ASTELAE	45.7	00.7	00	00				00	00	01	02	01	02		02		02													
	20	EPILANG	40.0	01.4						00	00																					
	21	ANEMMUL	40.0	00.4	01	00				00	00	00	00	00	01		01		00													
	22	ASTRALP	40.0	00.4	00	00				00	00	00	00	00	01		01		00													
	23	LINULEW	34.3	00.4	00	02				00	00	00	00	00	01		01		00													
	24	ALLICER	34.3	00.2		00				00	00	00	00	00	00		00		00													
	25	ZIZIAPT	34.3	00.1	00	00				00	00	00	00	00	00		00		00													
	26	SMILSTE	31.4	00.6																												
	27	OXYTSE	28.6	00.9																												
	28	HEDYBOR	25.7	00.8																												
	29	MERTPAN	22.9	01.7																												
	30	ANTEPAR	22.9	00.3																												
	31	STELLON	22.9	00.2																												
	32	RUMEAGE	22.9	00.1																												
	33	VIOLADU	20.0	00.2						01																						
	34	SOLIMIS	17.1	00.2																												
	35	LATHOCH	17.1	00.1																												
	36	OXYTMON	14.3	00.4																												
	37	ARTEFRI	14.3	00.2																												
	38	MYOSALP	14.3	00.1																												
	39	GENTAMA	14.3	00.1																												
	40	ASTECIL	11.4	00.1						00																						

Group name: Rough fescue-Hairy wildrye

		Plots																												
		Avg	Avg	MC81I		MC85I		MC88I		MC91I		MC94I		MC97I		MC99I		MC00I		YC79I		YC790		YC81I		YC810		YC85I		
LAYER	n	% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	
6																														
	SPECIES																													
41	ERIGSP	11.4	00.1																											
42	RUMEOC	11.4	00.1																											
43	SOLIMUL	11.4	00.1																											
44	HEUCRIC	11.4	00.1																											
45	GAILARI	11.4	00.0																											
46	ARTEUD	08.6	00.3																											
47	ASTEALP	08.6	00.1																											
48	PENSRO	08.6	00.0	00																										
49	TRIFREP	08.6	00.0																											
50	BOTRLUN	08.6	00.0																											
51	HEDYALP	05.7	00.2																											
52	GERARIC	05.7	00.1																											
53	ANDRSEP	05.7	00.0																											
54	SENEPAU	05.7	00.0																											
55	ARABHIR	05.7	00.0																											
56	ASTECON	05.7	00.0	00																										
57	GEUMALE	05.7	00.0																											
58	POTEANS	02.9	00.1																											
59	HEDYSUL	02.9	00.1																											
60	ANDRCHA	02.9	00.1																											
61	PLANMAJ	02.9	00.1																											
62	CASTFLA	02.9	00.1																											
63	POTEDIV	02.9	00.0																											
64	HETEVIL	02.9	00.0																											
65	POTEPEN	02.9	00.0																											
66	SONCARV	02.9	00.0																											
67	HIERCYN	02.9	00.0																											
68	ANTELAN	02.9	00.0																											
69	HIERUMB	02.9	00.0																											
70	VALEDIO	02.9	00.0																											
71	MIMUGUT	02.9	00.0																											
72	POLEPUL	02.9	00.0																											
73	GENTGLA	02.9	00.0																											
74	POTEFRU	02.9	00.0																											
75	RANUCAR	02.9	00.0																											
76	SISYMON	02.9	00.0																											
77	ANAPMAR	02.9	00.0																											
78	OXYTSPL	02.9	00.0																											
79	GENTCAL	02.9	00.0																											
80	PENSCON	02.9	00.0																											

Group name: Rough fescue-Hairy wildrye

		Plots																												
		Avg	Avg	MC81I		MC85I		MC88I		MC91I		MC94I		MC97I		MC99I		MC00I		YC79I		YC790		YC81I		YC810		YC85I		
LAYER	n	%	P	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	
6	SPECIES																													
	81	POTEARG	02.9	00.0																										
	82	ZIGAELE	02.9	00.0																										
	83	ARNICHA	02.9	00.0																										
	84	GEUMMAC	02.9	00.0																										
	85	POLEACU	02.9	00.0																										
	86	RHINMIN	02.9	00.0																										
	87	FESTSCA	0100	20.7	15																									
	88	AGROTRA	91.4	06.8	04	01																								
	89	ELYMINN	68.6	04.6																										
7	90	KOELMAC	62.9	01.3																										
	91	BROMCIL	45.7	01.5																										
	92	JUNCBAL	42.9	00.8																										
	93	POA PRA	42.9	00.5	02																									
	94	CAREOBT	37.1	03.5		02																								
	95	BROMINE	31.4	00.8		01																								
	96	HELIHOO	31.4	00.2																										
	97	CAREPRE	25.7	01.9																										
	98	POA SPP	17.1	00.3																										
	99	CARESP	14.3	01.0																										
	100	CAREXER	14.3	01.0																										
	101	FESTSAX	14.3	00.2																										
102	PHLEPRA	11.4	00.0																											
103	FESTIDA	08.6	00.2																											
104	CAREATR	08.6	00.2																											
105	BROMPUM	08.6	00.2																											
106	KOBRMYO	05.7	01.4																											
107	CARESP2	05.7	00.3																											
108	DANTPAR	05.7	00.3																											
109	AGROSMI	05.7	00.2																											
110	HIERODO	05.7	00.1																											
111	DANTCAL	05.7	00.1																											
112	FESTOVI	05.7	00.0																											
113	DESCCES	05.7	00.0																											
114	CARESP1	02.9	00.3																											
115	CARESC	02.9	00.3																											
116	STIPVIR	02.9	00.3																											
117	CAREFIL	02.9	00.1																											
118	AGROELY	02.9	00.0																											
119	POA ALP	02.9	00.0																											
120	AGROSTO	02.9	00.0																											

(Continued)

Group name: Rough fescue-Hairy wildrye

			Plots																											
LAYER	n	SPECIES	Avg	AVg	MC81I		MC85I		MC88I		MC91I		MC94I		MC97I		MC99I		MC00I		YC79I		YC790		YC81I		YC810		YC85I	
			% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
8	121	OXYTSE	02.9	00.0																										
	122	MOSSPP	02.9	00.0																										
	123	ANEMMUL	02.9	00.0																										
	124	AGOSGLA	02.9	00.0																										
	125	DODECON	02.9	00.0																										

(Continued)

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Rough fescue-Hairy wildrye

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(Continued)

Group name: Rough fescue-Hairy wildrye

LAYER		Plots																												
		YC850		UJR81I		UJR85I		UJR88I		UJR91I		UJR94I		UJR97I		UJR00I		PANT02		PANT13		PANT03		PANT43		PANT50		PANT26		
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	
6	SPECIES																													
41	ERICSP																													
42	RUMEOC		00			00		00										01												
43	SOLIMUL			00																										
44	HEUCRIC																													
45	GAILARI																													
46	ARTELUD																													
47	ASTEALP		00			00			01																					
48	PENSPRO																	00												
49	TRIFREP		00			00																								
50	BOTRLUN																													
51	HEDYALP																													
52	GERARIC																													
53	ANDRSEP																													
54	SENEPAU																													
55	ARABHTR																													
56	ASTECON																													
57	GEUMALE		00			00																								
58	POTEANS		00																											
59	HEDYSUL																													
60	ANDRCHA																													
61	PLANMAJ																													
62	CASTFLA																													
63	POTEDIV																													
64	HETEVL																													
65	POTEPEN																													
66	SONCARV																													
67	HIERCYN																													
68	ANTELAN																													
69	HIERUMB																													
70	VALEDIO																													
71	MIMUGUT																													
72	POLEPUL																													
73	GENTGLA																													
74	POTEFRU																													
75	RANUCAR																													
76	SISYMON																													
77	ANAPMAR																													
78	OXYTSPL																													
79	GENTCAL																													
80	PENSCON																													

Group name: Rough fescue-Hairy wildrye

			Plots																											
LAYER	n	SPECIES	YC850		UJR81I		UJR85I		UJR88I		UJR91I		UJR94I		UJR97I		UJR00I		PANT02		PANT13		PANT03		PANT43		PANT50		PANT26	
			Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
6	81	POTEARG																												
	82	ZIGAELE																												
	83	ARNICHA							00																					
	84	GEUMMAC							00																					
	85	POLEACU																												
	86	RHINMIN																												
	87	FESTSCA	02		23		04		42		58		22		21		20		10		34		18		11		18		19	
	88	AGOTRA	01		16		01		02		12		03		06		04		02		11		13		01		06		00	
	89	ELYMINN	04		02		05		14		09		12		07		11		06		01		17		01		03		00	
	90	KOELMAC			00		00		00						05		08		01		00		00		01		00		00	
	91	BROMCIL	00								00		04		02		03		03				00							
	92	JUNCBAL			00		00		01		06		03		03		02		05				00							
	93	POA PRA			00		00		00		12		00		00															
	94	CAREOBT	02																											
	95	BROMINE							00																					
	96	HELIHOO																												
	97	CAREPRE																												
	98	POA SPP							04				02		07		06		00		02		01		03		01		04	
	99	CARESP																												
	100	CAREXER																												
	101	FESTSAX																												
	102	PHLEPRA							00																					
	103	FESTIDA																												
	104	CAREATR																												
	105	BROMPUM																												
	106	KOBRMYO																												
	107	CARESP2																												
	108	DANTPAR																												
	109	AGROSMI																												
	110	HIERODO																												
	111	DANTCAL																												
	112	FESTOVI																												
	113	DESCCES																												
	114	CARESP1																												
	115	CARESIC																												
	116	STIPVIR																												
	117	CAREFIL																												
	118	AGROELY																												
	119	POA ALP							01																					
	120	AGROSTO							00																					

(Continued)

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Rough fescue-Hairy wildrye

		Plots																												
		YC850		UJR81I		UJR85I		UJR88I		UJR91I		UJR94I		UJR97I		UJR00I		PANT02		PANT13		PANT03		PANT43		PANT50		PANT26		
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	
LAYER	n																													
8	SPECIES																													
	121																													
	122																													
	123																													
	124																													
	125																													

(Continued)

Group name: Rough fescue-Hairy wildrye

LAYER n		Plots												FM02	
		PANT22		PANT40		PANT44		PANT59		PANT06		PANT20		FM03	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
5	SPECIES	03													
1	POTEFU	03	31	04	08					10		02		00	
2	ARCTUA		03									04		11	
3	ROSAACI	00								00		01			
4	POPUTRE														
5	POTEGRA														
6	POTEGRA	01	04	00	03					00		01			
7	ACHIMIL	00	03	00	00					00		01		00	
8	GALIBOR	00	00	00	00					00		00		15	
9	GEUMTRI	03	03	00	08					04		00		02	
10	VICIAME	03	04	01						01		01		00	
11	AGOSGLA	01		00	01					00		00		00	
12	CERAARV	02	00	01	00					00		00		00	
13	CAMPROT	03	02	01	00					00		01		00	
14	DELPGLA				00					00				00	
15	TARAOFF		00											00	
16	THALVEN														
17	FRAGVIR	00	03		03					00		07		00	
18	DODECON	00	00	00								00			
19	ASTELAE		00	01											
20	EPILANG	00		01	00					02		00		01	
21	ANEMMUL	02	00	01	00					01				02	
22	ASTRALP									00				00	
23	LINULEW		00	00											
24	ALLICER		00	00						00					
25	ZIZIAPT														
26	SMILSTE	00		00						01		00			
27	OXYTSE	03	01	07	05							00		11	
28	HEDYBOR	02	00	00	06							11			
29	MERTPAN									00				05	
30	ANTEPAR		02	00	00										
31	STELLON														
32	RUMEACE														
33	VIOLADU														
34	SOLIMIS	00	00		01							03			
35	LATHOCH		00												
36	OXYTMON														
37	ARTEFRI	00		01	00							00		07	
38	MYOSALP	00	00	00											
39	GENTAMA														
40	ASTECIL											00		01	

Group name: Rough fescue-Hairy wildrye

LAYER n		Plots											
		PANT22		PANT40		PANT44		PANT59		PANT06		PANT20	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
6	SPECIES												
41	ERIGSP		00	01				01					00
42	RUMEOCC											01	01
43	SOLIMUL									00			
44	HEUCRIC												
45	GAILARI							01					
46	ARTELUD	00						03					
47	ASTEALP												
48	PENSRO												
49	TRIFREP												
50	BOTRLUN												
51	HEDYALP												
52	GERARIC												
53	ANDRSEP	00		00								00	
54	SENEPAU												
55	ARABHIR												
56	ASTECON												
57	GEUMALE												
58	POTEANS												
59	HEDYSUL												
60	ANDROCHA			02				02					
61	PLANIAJ												
62	CASTFLA							01					
63	POTEDIV												
64	HETEVIL												
65	POTEPEN											01	
66	SONCARV												
67	HIERCYN												
68	ANTELAN												
69	HIERUMB												
70	VALEDIO											00	
71	MINUGUT												
72	POLEPUL												
73	GENTGLA											00	
74	POTEFRU												
75	RANUCAR												
76	SISYMON												
77	ANAPMAR												
78	OXYTSPL											00	
79	GENTCAL												
80	PENSCON												

(Continued)

Group name: Rough fescue-Hairy wildrye

			Plots																
			PANT22		PANT40		PANT44		PANT59		PANT06		PANT20		FM03		FM02		
			Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	
6	LAYER	n	SPECIES																
			81	POTEARG															
			82	ZIGAELE															
			83	ARNICHA															
			84	GEUMMAC															
			85	POLEACU															
7			RHINMIN																
			86	FESTSCA	14	21	10												
			87	AGROTRA	00	03					15	28					32	43	
			88	ELYMINN	02	01	05				08	03				22	12		
			89	KOELMAC	04	00	01				00	00				17	02		
			90	BROMCIL								02				01	02		
			91	JUNCBAL													00		
			92	POA PRA															
			93	CAREOBT															
			94	BROMINE	02		00				04	00			07				
			95	HELIHOO	01	00	01				00	00					13	02	
			96	CAREPRE															
97	POA SPP		00					02	03										
98	CARESP							02											
99	CAREXER	05	11	08										00					
100	FESTSAX	02																	
101	PHLEPRA																		
102	FESTIDA																		
103	CAREATR																		
104	BROMPUM																		
105	KOBRMYO																		
106	CARESP2																		
107	DANTPAR	02																	
108	AGROSMI									06									
109	HIERODO																		
110	DANTCAL																		
111	FESTOVI																		
112	DESCCES																		
113	CARESP1																		
114	CAREPIC																		
115	STIPVIR																		
116	CAREFIL																		
117	AGROELY																		
118	POA ALP																		
119	AGROSTO																		
120																			

Group name: Rough fescue-Hairy wildrye

		Plots															
		PANT22		PANT40		PANT44		PANT59		PANT06		PANT20		FM03		FM02	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER	SPECIES																
8	121																
	122																
	123																
	124																
	125																

Group name: Bog birch/R.fescue/Bearberry

LAYER n		Avg		Avg		Plots												SCAM90											
		% P	MC	EC910		EC911		EC940		EC941		EC971		EC970		EC001		EC000		SMB085		SMB086		SMB100		SMB000		SCAM90	
				Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
5	SPECIES	0100	32.2	41																									
1	BETUGLA	66.7	01.4																										
2	POTEFRU	38.1	00.5																										
3	SALIMYR	14.3	00.7																										
4	SALISPP	09.5	02.0																										
5	SALIBEB	04.8	00.5																										
6	ARCTUVA	04.8	00.0																										
7	SALIATH	04.8	00.0																										
8	FRAGVIR	0100	02.6	00																									
9	ACHIMIL	0100	02.6	02																									
10	GEUMTRI	90.5	05.5	01																									
11	GALIBOR	81.0	01.1	00																									
12	AGOSGLA	76.2	00.7	02																									
13	ARCTUVA	71.4	09.1	07																									
14	ASTRALP	71.4	01.6	01																									
15	PENSPRO	66.7	01.3	03																									
16	ZIZIAPT	66.7	00.5	00																									
17	VICIAME	61.9	01.3																										
18	EPILANG	57.1	01.7																										
19	ASTELAE	57.1	01.5																										
20	TARAOFF	57.1	00.4	02																									
21	CERAARV	52.4	00.3	00																									
22	SOLIMUL	42.9	01.0																										
23	THALVEN	42.9	00.7																										
24	DELPGLA	42.9	00.7																										
25	LATHOCH	42.9	00.6																										
26	POTEHIP	38.1	01.0	02																									
27	VIOLADU	38.1	00.5	02																									
28	POTEGRA	38.1	00.4																										
29	POLYVIV	38.1	00.3	00																									
30	VACCACAE	33.3	01.8	08																									
31	CREPRUN	33.3	01.1																										
32	ANTEPAR	33.3	00.2	00																									
33	CAMPROT	33.3	00.1																										
34	HEDYALP	28.6	01.0																										
35	SOLIMIS	28.6	00.5	05																									
36	RUBUARC	28.6	00.4	01																									
37	OXYTSE	28.6	00.3																										
38	GENTAMA	28.6	00.1	00																									
39	HEDYBOR	19.0	00.4																										
40	STELLON	19.0	00.3																										

Group name: Bog birch/R.fescue/Bearberry

[illegible]

(Continued)

Group name: Bog birch/R. fescue/Bearberry

		Plots																													
		Avg		Avg	EC910		EC911		EC940		EC94I		EC971		EC970		EC001		EC000		SMB085		SMB086		SMB100		SMB000		SCAM90		
		% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER 7	n	SPECIES																													
	81	DESCOES	14.3	00.2	02										00																
	82	FESTIDA	09.5	00.5	08																										
	83	LUZUMUL	09.5	00.1																											
	84	POA INT	09.5	00.1																											
	85	JUNCBAL	09.5	00.0																											
	86	PHLECOM	09.5	00.0																											
	87	BROMPUM	09.5	00.0																											
	88	MUHLCOUS	09.5	00.0																											
	89	KOELMAC	04.8	00.4																											
LAYER 8	90	CAREOBT	04.8	00.3																											
	91	CAREATR	04.8	00.1																											
	92	CAREAUR	04.8	00.0																											
	93	POA COM	04.8	00.0	00																										
	94	FESTRUB	04.8	00.0																											
	95	CALAMON	04.8	00.0																											
	96	AGROMER	04.8	00.0																											
	97	AGROSCA	04.8	00.0																											
	98	POA ALP	04.8	00.0																											
	99	CALACAN	04.8	00.0																											
	100	MOSSPP	66.7	27.2	30																										
	LAYER 9	101	PELTGAN	19.0	00.3																										
102		CLADSPP	09.5	00.0																											

(Continued)

Group name: Bog birch/R. fescue/Bearberry

		Plots															
		UNBU90		PANT31		PANT37		PANT57		PANT47		RF01		RF02		RF03	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER 5	n	SPECIES															
	1	BETUGLA	70		39		24		62		30		33		20		40
	2	POTEFRU	03	02	06						04				01		00
	3	SALIMYR	02												06		
	4	SALISPP		07					26		16		01				
LAYER 6	5	SALIBEB															
	6	ARCTUVA		10													
	7	SALIATH															
	8	FRAGVIR	04	01	02				00		04		05		09		08
	9	ACHIMIL	03	01	03				00		02		05		02		01
	10	GEUMTRI	05	06	07				01						05		07
	11	GALIBOR	02	00					00		00		00		00		01
	12	AGOSGLA		00							00		15		00		15
	13	ARCTUVA							00		02		01		03		07
	14	ASTRALP					05				01		03				01
	15	PENSPRO															
	16	ZIZIAPT	02														
	17	VICIAME	02	02	08				01		02		01		01		00
	18	EPILANG	04		02				02		06		02		08		03
	19	ASTELAE		03	00				00		05		03		03		07
	20	TARAOFF															
	21	CERAARV		00					00		00		00		00		00
	22	SOLIMUL															
	23	THALVEN	02						00						01		01
	24	DELPGLA			01		00				06				00		00
	25	LATHOCH															
	26	POTEHIP															
	27	VIOLADU															
	28	POTEGRA					04				01						
	29	POLYVIV															
	30	VACCACAE															
	31	CREPRUN															
	32	ANTEPAR			00												
	33	CAMPROT															
	34	HEDYALP															
	35	SOLIMIS															
	36	RUBUARC															
	37	OXYTSE															
	38	GENTAMA			00		00		00								
	39	HEDYBOR			01		02		05								
40	STELLON																

Group name: Bog birch/R.fescue/Bearberry

		Plots															
		UNBU90		PANT31		PANT37		PANT57		PANT47		RF01		RF02		RF03	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER 6	n																
	SPECIES																
	41																
	42																
	43																
	44																
	45																
	46																
	47																
	48																
7	49																
	50																
	51																
	52																
	53																
	54																
	55																
	56																
	57																
	58																
	59																
	60																
	61																
	62																
	63																
	64																
	65																
	66	27		22		31		10		10		26		27		37	
	67											07		20		13	
	68	05		02		00		07		07		07		16		09	
	69	12												00		00	
	70					04				06		07		15		08	
	71									00							
	72											01		00		00	
	73	22															
	74																
	75																
	76																
	77																
	78																
	79	07															
	80																02

(Continued)

Group name: Boq birch/R. fescue/Bearberry

		Plots															
		UNBU90		PANT31		PANT37		PANT57		PANT47		RF01		RF02		RF03	
		Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER 7	n																
	SPECIES																
	81	DESCES															
	82	FESTIDA															
	83	LUZUMUL															
	84	POA INT															
	85	JUNGBAL															
	86	PHLECOM															
	87	BROMPUM															
	88	MUHLCUS															
	89	KOELMAC															
	90	CAREOBT															
	91	CAREATR															
	92	CAREAUR															
	93	POA COM															
	94	FESTRUB															
	95	CALAMON															
	96	AGROMER															
	97	AGROSCA															
	98	POA ALP															
8 9	99	CALACAN															
	100	MOSSPP															
	101	PELTCAN															
	102	CLADSPP															

RESOURCE INVENTORY, EDMONTON ALBERTA

Group name: Rough fescue-Tufted hairgrass

[illegible]

(Continued)

Group name: Rough fescue-Tufted hairgrass

[illegible]

Group name: Harrison flats

				Plots													
				Avg		H183		H187		H195		H383		H387		H395	
LAYER	n	SPECIES	% P	Avg	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
5	1	POTEFRU		0100	09.9	10		05		02		15		13		13	
	2	JUNIHOR		16.7	00.8	05											
	3	SALISPP		16.7	00.0												
	4	THALVEN		0100	02.9	00		05		01		00		05		01	
6	5	GALIBOR		0100	01.2	01		01		00		04		02		00	
	6	OXYTMON		83.3	08.7	10		26		06		07		01		01	
	7	ACHIMIL		83.3	03.9	00		10				01		07		03	
	8	HEDYALP		83.3	02.6	00				00		00		13		00	
	9	ERIGCAE		83.3	01.4	00		05		02		00		00		00	
	10	AGOSGLA		83.3	01.3			00		00		01		01		04	
	11	CERAARV		83.3	01.0	00		01				01		01		01	
	12	GEUMTRI		66.7	07.3	00						20		17		05	
	13	DELPGLA		66.7	02.2					00		00		07		04	
	14	CAMPROT		66.7	01.5	00		05		02		00					
	15	STELLON		66.7	00.6	01		12		01		00		00			
	16	ANTEPAR		50.0	03.2	06											
	17	TARAOFF		50.0	00.6			00						02		02	
	18	CREPRUN		50.0	00.5					00		00					
	19	ANEMMUL		50.0	00.5	00				02		00				00	
	20	POTEDIV		50.0	00.2							00		00		00	
21	SISYMON		50.0	00.2					00				00		00		
22	POTEGRA		50.0	00.1					00				00				
23	ANDRCHA		33.3	02.1				10		02							
24	SELADEN		33.3	01.7	05			05									
25	ARTEFRI		33.3	01.0	05			01									
26	RUMEACE		33.3	00.5													
27	LINULEW		33.3	00.4													
28	ZIZIAPT		33.3	00.2													
29	GENTAMA		33.3	00.1	00												
30	ASTRALP		33.3	00.1													
31	ARNIFUL		16.7	01.1													
32	ARCTUVA		16.7	00.8	05												
33	POTEPEN		16.7	00.8				05									
34	ASTECIL		16.7	00.5													
35	ASTROU		16.7	00.2								01					
36	SOLIMUL		16.7	00.2				01									
37	RANUCYM		16.7	00.1													
38	DODEPUL		16.7	00.1													
39	OXYTDEF		16.7	00.0								00					
40	VIOLADU		16.7	00.0													

(Continued)

Group name: Harrison flats

[illegible]

Group name: Ya Ha Tinda (R.fescue-H.wildrye

			Plots															
			Avg		YE03		YE05		YE06		YE02		YE07		YE01		YE09	
			% P	MC	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg
LAYER 5	n	SPECIES																
		POTEFRU	85.7	02.0	00		02		01		02		01					04
		POPUTRE	28.6	00.2			00											00
		BETUGLA	14.3	00.6	04													
		SALIGLA	14.3	00.2	01													
6	5	ROSAACI	14.3	00.1														01
	6	CAMPROT	0100	01.1	00		03		00		00		02		00		01	
	7	OXYTMON	85.7	07.8	01		03				01		12		27		07	
	8	HEDYALP	85.7	02.8	00		05		09		00		03		04		00	
	9	AGOSGLA	85.7	01.7	01						01		02		01		00	
	10	GALIBOR	85.7	01.3	00		03				02		01		01		00	
	11	ANTEPAR	85.7	01.0	00		00		00		01		00		03		00	
	12	ASTELAE	85.7	00.7	00		01		00		01		12		00			
	13	GEUMTRI	71.4	09.0	03		14		20		12		02		03		01	
	14	ANEMMUL	71.4	01.5					01		02		01		03			
	15	ANDRCHA	71.4	00.8	00		00		00		02		02		00		00	
	16	POTEGRA	71.4	00.5	01		00				00		01		00		00	
	17	ACHIMIL	57.1	02.4	00		08		04				02		02		00	
	18	THALOCC	57.1	00.9					02		00		01		01		00	
	19	ARTEFRI	57.1	00.4					00				00		00		00	
	20	CERAARV	57.1	00.2	00				00				00		00		02	
	21	ANTELAN	42.9	02.2					09				03		00		00	
	22	VICIAME	42.9	01.5	05		04										01	
	23	OXYTSPL	42.9	01.1			00		00		06		00		00		02	
	24	ASTECIL	42.9	00.5					01		01		00					
	25	VIOLADU	42.9	00.1					00		00		00					
	26	COMAUMB	28.6	00.7			03											
	27	LINULEW	28.6	00.4					00		02							
	28	SOLIMUL	28.6	00.4														
	29	THALVEN	28.6	00.4	01		01											
	30	FRAGVIR	28.6	00.4	01													
31	DELPGLA	28.6	00.3	01				01										
32	ZIZIAPT	28.6	00.1	00				00										
33	EPILANG	28.6	00.1	00		00												
34	SMILSTE	14.3	00.4					02										
35	ANTEROS	14.3	00.3	02														
36	OXYTSER	14.3	00.3															
37	LATHOCH	14.3	00.1			00												
38	HIERUMB	14.3	00.0	00														
39	PENSPRO	14.3	00.0	00														
40	POTEDIV	14.3	00.0					00										

Group name: Ya Ha Tinda (R.fescue-H.wildrye

			Plots													
LAYER	n	SPECIES	Avg	Avg	YE03		YE05		YE06		YE07		YE09			
					Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg	Cv	Vg		
7	41	FESTSCA	0100	09.6	07		09	08			18		04	07		
	42	CAREFIL	0100	07.6	01	14	14	06	10	05	05	10	05			
	43	KOELMAC	0100	04.4	01	03	03	06	02	03	03	10	03			
	44	AGRODAS	0100	04.0	10	07	01	01	00	02	02	03	03			
	45	BROMCIL	85.7	07.2	02	08	17	17	10	11	11	00	00			
	46	TRISSPI	85.7	01.9	03	02	03	02	03	00	01	02	02			
	47	POA SEC	71.4	01.9	01	08		08		00	00	02	00			
	48	CAREPRE	42.9	02.7	07	11		00		04						
	49	ELYMINN	42.9	02.3	10	00										
	50	POA NER	28.6	02.4	00				16							
	51	JUNCBAL	28.6	00.7				00		04						
	52	FESTSAX	28.6	00.4	00											
	53	BROMINE	14.3	00.5	03			03				02				
	54	KOBRSIM	14.3	00.5												
	55	CAREPRA	14.3	00.2					01							
	56	HIERODO	14.3	00.0		00										



Group name: Ya Ha Tinda (Sedge-Junegrass)

				Plots			
				YWO1		YWO3	
LAYER	n	SPECIES	Avg	% P	MC	Cv	Vg
5	1	POTEFRU	0100 07.6	09		05	
6	2	OXYTSPL	0100 03.2	06		00	
	3	ANEMMUL	0100 03.1	02		03	
	4	GEUMTRI	0100 02.1	01		02	
	5	OXYTMON	0100 01.6	00		03	
	6	CAMPROT	0100 00.8	01		00	
	7	CERAARV	0100 00.5	00		00	
	8	AGOSGLA	0100 00.4	00		00	
	9	POTEDIV	0100 00.4	00		00	
	10	VALEDIO	50.0 01.9			03	
	11	ARTEFRI	50.0 01.4	02			
	12	ZIGAELE	50.0 01.1	02			
	13	SMILRAC	50.0 00.8	01			
	14	ANDRCHA	50.0 00.8	01			
	15	THALVEN	50.0 00.6	01			
	16	VIOLADU	50.0 00.5	01			
	17	ANTEPAR	50.0 00.3			00	
	18	OXYTSER	50.0 00.1	00			
	19	POTEGRA	50.0 00.1	00			
	20	GALIBOR	50.0 00.1	00			
7	21	CARESPP	0100 06.3	06		06	
	22	KOELMAC	0100 05.2	06		04	
	23	POA PRA	0100 03.3	02		04	
	24	FESTSAX	0100 02.9	01		04	
	25	POA SEC	0100 01.3	01		01	
	26	ELYMINN	0100 00.9	00		01	
	27	AGROREP	50.0 01.0	02			
	28	BROMINE	50.0 00.6	01			
	29	DANTPAR	50.0 00.2			00	
9	30	LICHEN	0100 06.8	01		12	